In The Specification:

Please amend the paragraphs in the BRIEF DESCRIPTION OF THE DRAWINGS section beginning at page 22 and ending at page 25 as follows:

--BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 includes a schematic perspective drawing and a flowchart for explaining a method of forming a periodic structure according to an embodiment of the present invention;

Fig. 2 is a schematic diagram showing a configuration of an apparatus to be used for forming a periodic structure according to the embodiment;

Figs. 3[[~~A~~]](a) is a plan view showing a periodic structure formed on a silicon surface by three-times laser scanning parallel to a direction of polarization, by the method of forming a periodic structure according to the embodiment;

Fig. 3[[~~B~~]](b) is an enlarged view showing a part of the periodic structure of Fig. 3[[~~A~~]](a);

Figs. 4[[~~A~~]](a) is a plan view showing a periodic structure formed on a silicon surface by three-times laser scanning orthogonal to a direction of polarization, by the method of forming a periodic structure according to the embodiment;

Fig. 4[[~~B~~]](b) is an enlarged view showing a part of the periodic structure of Fig. 4[[~~A~~]](a);

Fig. 5 is a plan view showing a periodic structure formed on a silicon surface with a laser fluence closest possible to the ablation threshold, by the method of forming a periodic structure according to the embodiment;

Fig. 6 is an enlarged plan view showing a periodic structure formed with a cylindrical lens placed on the silicon surface, by the method of forming a periodic structure according to the embodiment;

Fig. 7 is a plan view showing a periodic structure formed with a cylindrical lens placed on a surface of a copper tape, by the method of forming a periodic structure according to the embodiment;

Figs. 8[[~~A~~]](a) and 8[[~~B~~]](b) are enlarged plan views showing a periodic structure formed on a surface of an aluminum tape and an aluminum foil, respectively, by the method

of forming a periodic structure according to the embodiment;

Figs. 9[[~~A~~]](a) and 9[[~~B~~]](b) are drawings for explaining generation of an S- type interference and an S+ type interference, respectively, between an incident beam and scattered wave.

Fig. 10 is a drawing for explaining a definition of specimen feeding direction when the incident beam is inclined;

Figs. 11[[~~A~~]](a) and 11[[~~B~~]](b) are enlarged plan views showing a periodic structure of the S- type and S+ type, respectively, formed by feeding the copper tape in the direction L;

Figs. 12[[~~A~~]](a) and 12[[~~B~~]](b) are enlarged plan views showing a periodic structure of the S- type and S+ type, respectively, formed by feeding the copper tape in the direction R;

Fig. 13 is a line graph showing an incident angle dependency of ripple spacing of a periodic structure formed on silicon and copper;

Figs. 14[[~~A~~]](a) and 14[[~~B~~]](b) are drawings for explaining a formation mechanism of a periodic structure with the feeding direction of L and R, respectively;

Figs. 15[[~~A~~]](a) and 15[[~~B~~]](b) are enlarged schematic perspective views showing a periodic structure formed in an X and Y direction, respectively;

Figs. 15[[~~C~~]](c) is an enlarged schematic perspective view showing a composite type periodic structure formed so as to overlap in X and Y directions;

Figs. 15[[~~D~~]](d) is an enlarged schematic perspective view showing a periodic structure formed in X and Y directions in a mixed layout;

Fig. 16 is a schematic diagram showing a configuration of a periodic structure forming apparatus that forms a periodic structure oriented in different directions at a time;

Fig. 17 is a schematic side view showing a rotational sliding test apparatus;

Figs. 18[[~~A~~]](a) to 18[[~~D~~]](d) are plan views respectively showing a periodic structure of a radial pattern, a concentric circle pattern, a first spiral pattern and a second spiral pattern;

Fig. 19 is a line graph showing a variation characteristic of a sliding speed utilized in the rotational sliding test;

Figs. 20[[~~A~~]](a) to 20[[~~D~~]](d) are line graphs showing a sliding speed and a friction coefficient characteristics obtained through the sliding tests, with respect to sliding between mirror surfaces, between the radial pattern and the mirror surface, between the concentric circle pattern and the mirror surface, and between the spiral 1 pattern and the mirror surface,

respectively;

Figs. 21[[~~A~~]](a) and 21[[~~B~~]](b) are plan views showing a periodic structure of the radial pattern and the concentric circle pattern, respectively, with a friction wear after a loaded sliding test;

Figs. 22[[~~A~~]](a) and 22[[~~B~~]](b) are plan views showing a periodic structure of the radial pattern and the concentric circle pattern, respectively, where a friction wear is not caused after a loaded sliding test; and

Figs. 23[[~~A~~]](a) to 23[[~~C~~]](c) are line graphs showing a sliding speed and a friction coefficient characteristics obtained through a disc/disc sliding test, with respect to a disc having a concentric circle pattern (23[[~~A~~]](a)), a radial pattern (23[[~~B~~]](b)), and a first spiral pattern (23[[~~C~~]](c)), respectively.--

Please amend the paragraph beginning at line 16 of page 28 as follows:

--A surface of the silicon substrate, employed as the specimen 2, was scanned three times by the laser beam 1 near the ablation threshold, through a plano-convex lens 24 of a focal length of 100 mm, to thereby form a periodic structure. Figs. 3[[~~A~~]](a) and 3[[~~B~~]](b) show the periodic structure formed with the scanning direction of the laser beam 1 and the direction of polarization set in parallel. Figs. 4[[~~A~~]](a) and 4[[~~B~~]](b) show the periodic structure formed with the direction of polarization rotated by 90 degrees. Figs. 3[[~~A~~]](a) and 4[[~~A~~]](a) show an overall appearance, while Figs. 3[[~~B~~]](b) and 4[[~~B~~]](b) show enlarged images of the periodic structure. Referring to Figs. 3[[~~A~~]](a) and 4[[~~A~~]](a), the laser beam irradiation was suspended halfway of the second scan, for visual understanding that the scanning was performed three times. These periodic structures are all oriented orthogonally to the direction of polarization. The ripple spacing of the periodic structure is approx. 700 nm, which is slightly shorter than the laser wavelength λ (800 nm). Overlapped sections of the scanning do not present a significant disorder.--

Please amend the paragraph beginning at line 15 of page 29 as follows:

--In order to form the periodic structure over a more extensive area, a beam expander was employed to expand the laser beam, and also a cylindrical lens having a focal length of

100 mm was employed. As a result, the periodic structure has been formed in a width exceeding 2 mm by one scan. Such periodic structure is shown in Fig. 6. The ripple spacing is 700 nm, which is similar to that of the periodic structure formed by the laser beam near the ablation threshold through the plano-convex lens as Fig. 3[[~~B~~]](b).--

Please amend the paragraph beginning at line 21 of page 30 as follows:

--Upon forming a periodic structure on the aluminum tape and the aluminum foil through the beam expander and the cylindrical lens having the focal length of 100 mm, periodic structures respectively shown in Figs. 8[[~~A~~]](a) and 8[[~~B~~]](b) have been obtained. The ripple spacing of the periodic structure on the aluminum tape and the aluminum foil is 600 nm. Upon irradiating a white light on both of the periodic structures, a spectroscopic capability has been confirmed. Also, thermal effect has not been observed on a rear face of the aluminum foil of 15 μm in thickness.--

Please amend the paragraph beginning at line 8 of page 31 as follows:

--When a laser beam 1 of a wavelength λ is irradiated on the specimen 2 at an incident angle θ, two types of interference take place as shown in Figs. 9[[~~A~~]](a) and 9[[~~B~~]](b). Hereinafter, in order to distinguish these interferences, the interference with a wider interval as shown in Fig. 9[[~~A~~]](a) is defined as an "S- type" interference, and the interference with a narrower interval as shown in Fig. 9[[~~B~~]](b) as an "S+ type" interference. When the respective intervals are designated by X_{S-} and X_{S+}, the interval X_{S-} in the case of Fig. 9[[~~A~~]](a) is obtained by the following formula:

[Formula 1]

$$X_{s-} = \frac{\lambda}{1-\sin\theta}$$

The interval X_{S+} in the case of Fig. 9[[~~B~~]](b) is obtained by the following formula:

[Formula 2]

$$X_{s+} = \frac{\lambda}{1+\sin\theta}$$ --

Please amend the paragraph beginning at line 12 of page 32 as follows:

--Figs. 11[[~~A~~]](a) and 11[[~~B~~]](b) show a periodic structure formed on the copper tape at the incident angle of 45 degrees and in the feed direction L. The images of Figs. 11[[~~A~~]](a) and 11[[~~B~~]](b) have been shot toward a same point with different focus, in which the S- type periodic structures can be clearly observed, and can also be vaguely seen when observing the S+ type periodic structure, since both of the S- and S+ type periodic structures are formed at the same position when moved in the feed direction L.--

Please amend the paragraph beginning at line 21 of page 32 as follows:

--Figs. 12[[~~A~~]](a) and 12[[~~B~~]](b) show a periodic structure formed on the copper tape at the incident angle of 45 degrees and in the feed direction R. In this feed direction R also the both types of periodic structures have been obtained, however the S- type periodic structure is often interrupted, and can barely be seen when observing the S+ type periodic structure. Accordingly, it is proven that the S- type periodic structure is more clearly formed when moved in the feed direction L.--

Please amend the paragraph beginning at line 8 of page 33 as follows:

--A reason that the S- type periodic structure having a wider ripple spacing is more clearly formed when moved in the feed direction L can be explained as follows. In the case of the feed direction L, the S- type periodic structure 31 is first formed on a plane surface as shown in Fig. 14[[~~A~~]](a), and the S+ type periodic structure 32 is formed so as to overlap when the specimen 2 is moved. By contrast, in the case of the feed direction R, since the S+ type periodic structure 32, which has a narrower ripple spacing, is first formed on the plane surface as shown in Fig. 14[[~~B~~]](b), there is no longer enough room for the S- type periodic structure to be clearly formed.--

Please amend the paragraph beginning at line 17 of page 34 as follows:

--As already described in details, irradiating a laser beam on a material surface and perform a scanning with the irradiating beam leads to formation of a periodic structure,

according to the present invention. Here, when a direction of polarization of the laser beam is set in a direction Y, a periodic structure 8_X oriented in a direction X is obtained as shown in Fig. 15[[~~A~~]](a), while setting the direction of polarization of the laser beam in the direction X results in formation of a periodic structure 8_Y oriented in a direction Y, as shown in Fig. 15[[~~B~~]](b).--

Please amend the paragraph beginning at line 1 of page 35 as follows:

--Also, changing a direction of polarization of the laser beam allows changing a direction of the periodic structure. Based on this, in the case where, after once forming a periodic structure 8_X oriented in one direction as shown in Fig. 15[[~~A~~]](a) by irradiating a laser beam near an ablation threshold and executing an overlapped scanning on the irradiated region in one direction, a relative angle between the material surface and the direction of polarization of the laser beam is changed, followed by irradiation of the laser beam near the ablation threshold and overlapped scanning on the irradiated region over the periodic structure already formed so as to form a periodic structure 8_Y in a different direction, a composite grating structure 8_Z overlapped in a different direction can be formed.--

Please amend the paragraph beginning at line 14 of page 35 as follows:

--Accordingly, changing the relative angle between the material surface and the direction of polarization of the laser beam by 90 degrees as shown in Fig. 15[[~~C~~]](c), when forming the latter periodic structure, results in formation of a check patterned periodic structure 8_Z, and changing the relative angle between the material surface and the direction of polarization of the laser beam by a desired angle other than 90 degrees leads to formation of a bias check patterned periodic structure.--

Please amend the paragraph beginning at line 22 of page 35 as follows:

--Referring now to Fig. 15[[~~D~~]](d), in the case where, after once forming a periodic structure 8_X in one direction by irradiating a laser beam near an ablation threshold and executing an overlapped scanning on the irradiated region in one direction, a relative angle

between the material surface and the direction of polarization of the laser beam is changed, followed by irradiation of the laser beam near the ablation threshold on a region adjacent to or spaced from the periodic structure 8_X already formed and overlapped scanning on the newly irradiated region, another periodic structure 8_Y can be formed in a different direction in the region adjacent to or spaced from the first formed periodic structure 8_X. Accordingly, changing the relative angle between the material surface and the direction of polarization of the laser beam by 90 degrees, when forming the latter periodic structure, results in formation of a periodic structure 8_X in an X direction and the other 8_Y in a Y direction, disposed in a mixed layout, and changing the relative angle between the material surface and the direction of polarization of the laser beam by a desired angle other than 90 degrees leads to formation of the periodic structures oriented in different directions and disposed in a mixed layout.--

Please amend the paragraph beginning at line 19 of page 36 as follows:

--Also as already stated, based on the fact that changing the direction of polarization of the laser beam leads to a change in the orientation of the periodic structure, a grating structure overlapped in different directions as shown in Fig. 15[[~~c~~]](c) can be formed through one process utilizing a periodic structure forming apparatus 40 as shown in Fig. 16. The periodic structure forming apparatus 40 of Fig. 16 emits a laser beam L_0 generated by a titanium-sapphire laser generator 41, so that the laser beam L_0 is totally reflected by a mirror 42, and split by a half mirror 43 into a reflected laser beam L_1 and a transmitted laser beam L_2. Then the reflected laser beam L_1 is totally reflected by mirrors 44, 45, so as to produce an optical delay 46 on the transmitted laser beam L_2. This optical delay 46 includes mirrors 47, 48. Laser beams L_3, L_4 produced by polarizing the laser beams L_1, L_2 with polarizer 49, 50 are provided to a half mirror 51, so that the half mirror 51 merges the polarized laser beams L_3, L_4 and irradiates through a lens 52 to a surface of a material 54 set on an X-Y table 53. In this way, the laser beams L_3, L_4 near the ablation threshold having a plurality of pulses and different directions of polarization can be irradiated to the surface of the material 54 at a determined time interval. Then executing an overlapped scanning over the irradiated region results in spontaneous and simultaneous formation of a periodic structure 8_Z overlapped in different directions as shown in Fig. 15[[~~c~~]](c).--

Please amend the paragraph beginning at line 19 of page 37 as follows:

--Accordingly, for example, irradiating the laser beams L_3, L_4 near the ablation threshold having a plurality of pulses and directions of polarization that are different by 90 degrees at a predetermined time interval, and executing an overlapped scanning over the irradiated region, results in spontaneous and simultaneous formation of a check patterned periodic structure 8_Z as shown in Fig. 15[[~~C~~]](c), in which the periodic structure 8_X oriented in an X direction and the periodic structure 8_Y oriented in a Y direction which is orthogonal to the X direction are overlapping. Also, irradiating laser beams near an ablation threshold having a plurality of pulses and directions of polarization that are different by a desired angle other than 90 degrees at a predetermined time interval, and executing an overlapped scanning over the irradiated region, results in spontaneous and simultaneous formation of a bias check patterned grating structure intersecting in the desired angle other than 90 degrees.--

Please amend the paragraph beginning at line 25 of page 40 as follows:

--The disc-shaped test pieces are made of an ultra-hard alloy, on which various ring-shaped periodic structures have been formed as shown in Figs. 18[[~~A~~]](a) to 18[[~~D~~]](d). Fig. 18[[~~A~~]](a) shows a radial periodic structure, Fig. 18[[~~B~~]](b) shows a concentric circle pattern radial periodic structure, Fig. 18[[~~C~~]](c) shows a first spiral periodic structure, and Fig. 18[[~~D~~]](d) shows a second spiral periodic structure. The first spiral periodic structure of Fig. 18[[~~C~~]](c) and the second spiral periodic structure of Fig. 18[[~~D~~]](d) are different in the direction (angle) of the spiral pattern.--

Please amend the paragraph beginning at line 8 of page 43 as follows:

--Figs. 20[[~~A~~]](a) to 20D are line graphs showing a sliding test result in which the fixed test pieces having the mirror surface (20[[~~A~~]](a)), a periodic structure of the radial pattern (20[[~~B~~]](b)), a periodic structure of the concentric circle pattern (20[[~~C~~]](c)) and a periodic structure of the first spiral pattern (20[[~~D~~]](d)) were respectively used.

In the case of the test piece with the mirror surface of Fig. 20[[~~A~~]](a), the friction coefficient sharply increased immediately upon starting the sliding test. With respect to the test piece having the radial pattern periodic structure of Fig. 20[[~~B~~]](b), the friction

coefficient significantly decreased in comparison with the test piece with the mirror surface. With respect to the test piece having the concentric circle pattern periodic structure as Fig. 20[[~~C~~]](c), a visible fluid lubrication region has not been observed. In the case of the first spiral pattern periodic structure as Fig. 20[[~~D~~]](d), an intermediate characteristic between the radial pattern periodic structure and the concentric circle periodic structure has been observed, in the aspects of the fluid lubrication region and conformability in mixed lubrication. With respect to the test piece with the second spiral periodic structure, since the pattern serves as a pump to discharge the pure water from a central portion toward a peripheral portion because of the sliding motion, the friction coefficient suddenly increased up to higher than 0.5 once the pure water was completely discharged.--

Please amend the paragraph beginning at line 9 of page 44 as follows:

--For evaluating discharging capability of worn powder, the load was increased to 100N, which is ten times as great as the load of an ordinary test, under which traces of wear were formed on the periodic structures, and observation thereof was performed. Fig. 21[[~~A~~]](a) shows a state of the radial pattern periodic structure, and Fig. 21[[~~B~~]](b) that of the concentric circle periodic structure. While the radial pattern periodic structure has been fully filled with the worn powder, grooves of the concentric circle periodic structure still remain uncovered with the worn powder, though scale-shaped worn particles are formed on the periodic structure.

Figs. 22[[~~A~~]](a) and 22[[~~B~~]](b) show a state of the periodic structure of the same test pieces as Figs. 21[[~~A~~]](a) and 21[[~~B~~]](b), but at a portion where the trace of wear is not produced. On the radial pattern periodic structure of Fig. 22[[~~A~~]](a) not much worn powder is observed, while a multitude of worn powders of approx. 100 nm is stuck on the concentric circle periodic structure of Fig. 22[[~~B~~]](b). In view of this, it is understood that the worn waste has barely moved from where it was produced in the radial pattern periodic structure, while the worn powder is discharged with the fluid by the grooves on the concentric circle periodic structure.--

Please amend the paragraph beginning at line 7 of page 45 as follows:

--Figs. 23[[~~A~~]](a) to 23[[~~C~~]](c) are line graphs showing changes in friction coefficient of the test pieces having the concentric circle periodic structure (23[[~~A~~]](a)), the radial pattern periodic structure (23[[~~B~~]](b)), and the first spiral pattern periodic structure (23[[~~C~~]](c)), respectively. In all these test samples, mutual sliding of the mirror surfaces takes place in a central portion thereof. However with respect to the concentric circle periodic structure in particular, which does not practically produce a load capacity, the greatest friction coefficient was presented since a sliding friction readily takes place.--